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SCIENCE REVIEW OF THE YEAR

SCIENCE NEWS LETTER

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THE WEEKLY SUMMARY OF CURRENT SCIENCE • DECEMBER 18, 1943



Against Malaria

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A SCIENCE SERVICE PUBLICATION

ENGINEERING

Electron Microanalyzer

New instrument can identify in a few minutes the chemical elements in parts of the smallest germ and virus—particles 1/100,000 of an inch in diameter.

► CHEMICAL elements composing such extremely minute sub-microscopic objects as the tail or head of a germ or a virus, particles no larger than 1/100,000 of an inch in diameter, can be identified in a few minutes by a new instrument, the electron microanalyzer, developed by Dr. James Hillier of RCA Laboratories. (*Physical Review*, Nov. 1 and 15)

As a running mate to the electron microscope, the new instrument will allow the determination of the composition as well as the size, shape and internal structure of the particles which a few years ago were quite beyond the most powerful means of exploration in the microscopic world.

In the electron microanalyzer a very small area of the specimen is irradiated with an electron probe, a stream of these particles of electricity brought into a beam by a two-stage magnetic lens system. The electrons transmitted by the irradiated area of the specimen are focused by a third magnetic lens so that

the electron probe is reformed. The amount of energy lost by the electrons is measured through a photographic exposure, and the position of markings in the electron velocity distribution indicates the presence of a chemical element in the specimen.

The new instrument is now in experimental use.

In discussing the future significance of the microanalyzer, Dr. Hillier said that before the extra information being revealed by the electron microscope can be applied by any of the physical, chemical, and biological sciences, it must be translated into a form that is of significance to the individual problems being investigated.

"After looking at an electron micrograph and noting the physical characteristics of the object," he continued, "the scientist invariably asks, 'What is this?' He knows that he had a test tube of a specimen consisting of a number of chemicals, but now he has within his vision a number of different types of

particles which are undoubtedly made up of some of the chemicals from the original bulk specimen.

"If the original specimen was a test tube of bacteria, the scientist knew that it consisted of a number of proteins and other organic materials. But on looking at the electron micrograph, he finds that the bacteria have flagella, cell membranes, and structure in their protoplasm which often includes granules and particles surrounding it which he did not know existed. To find out the chemical structure of these particles, he must perform a number of tests on the bacteria. This procedure is very tedious, and not always successful."

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MICROSCOPY

Device Cuts Ultra-Thin Slices for Microscope

► SLICES of animal and plant material only one five-hundredth as thick as a human hair are cut for use under the electron microscope by means of a high-speed cutting device developed by Dr. H. C. O'Brien and Dr. G. M. McKinley of the University of Pittsburgh. (*Science*, Nov. 19) The sections are only a hundredth as thick as those prepared on ordinary microtomes for use with conventional laboratory microscopes.

The customary microscopic sections are far too thick for examination with the electron microscope, the Pittsburgh scientists explain, because the effect of this new instrument is obtained by shooting beams of electrons right through the specimen, and this requires ultra-thinness not obtainable with the microtomes (laboratory slicing machines) now in use.

Difficulty of obtaining ultra-thin sections has been due to the yielding of the tissues when the knife strikes them, even when they have been embedded in wax or other material for support. Drs. O'Brien and McKinley solved this difficulty by making the knife come at the material so fast that it didn't have time to dodge. They mounted it on the edge of a rapidly revolving flywheel, turning at the rate of 10,000 times or more a minute. This gave the knife a rifle-bullet speed, so that when its edge struck the specimen it sheared off a slice before the tissue could yield or bend.

The ultra-thin slices floated off into the air, and were picked up directly on the specimen carriers used under the electron microscope.

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MICROANALYZER—Dr. James Hillier (left) and Dr. V. K. Zworykin, associate research director, RCA Laboratories, with the new instrument developed by Dr. Hillier.

GENERAL SCIENCE

Carnegie Researches

Annual report tells of new hybrid grasses being developed, the earliest known cactus, early human embryo specimens and a frog without a tadpole stage.

► **UNTAMED** native grasses of western rangelands, stand-by of the livestock industry since the first wild-eyed longhorns were driven in by pioneer ranchers, are scheduled to give place to new, man-made varieties with deeper, tougher roots and more nutritious stalks and leaves, it is disclosed in the annual report of the Carnegie Institution of Washington, presented to the trustees by Dr. Vannevar Bush, president.

Qualities sought for in the new hybrid grasses now under test, and even newer hybrids that have been planned but not yet actually bred, are greater resistance to drought, stronger soil-binding abilities against erosion, and greater value as hay and pasture. The breeding method used is known as the induction of amphiploidy, which means the crossing of rather remotely related species in such a way that the offspring receive whole sets of the heredity-bearing chromosomes from each parent instead of only half-sets as is usually the case. This brings about combinations of both parents' desirable qualities, and also the lusty habit of growth known as hybrid vigor.

Thus far, races of bluegrass have been employed in the breeding work. Next year this work will be extended, and species of wheat grass will also be included.

The program is a cooperative one between the Carnegie Institution and the U. S. Soil Conservation Service. Carnegie geneticists under the direction of Dr. H. A. Spoehr are doing the plant breeding work, and the Soil Conservation Service research men will then plant the new varieties in the field for performance tests.

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Earliest Known Cactus

► **DESCRIBED** in the report is a fossil of the earliest known cactus. It dates back into the first part of the Age of Mammals, or Eocene period, 50 million years or so ago. Before this fossil was identified as a cactus it had been thought that the cactus family had a much short-

er ancestry than is now indicated. The fossil has been given the generic name *Eopuntia*, or dawn cactus, by Dr. Ralph Chaney.

Finding the fossil of a fleshy-jointed plant like a cactus is a great rarity, it is pointed out. Most plant fossils are either petrifications of hard, woody parts or the imprints of leaves that fell into mud and were covered up by new layers of silt. For this reason, fossils of swamp and pond plants are common but those of desert plants extremely few.

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Very Early Human Embryos

► **HUMAN EMBRYOS** in their eighth, tenth and nineteenth days from conception have been added to the small but slowly growing group of specimens available for the study of the pre-birth life of our own species, Dr. George W. Corner reports. The two earlier-stage specimens, which were studied by Dr. A. T. Hertig and Dr. John Rock, are in the Carnegie Institution collection. The 19-day one is at the University of North Carolina, in the possession of Dr. W. C. George.

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Tadpole-less Frog Species

► **AN EXTRAORDINARY** developmental history farther down the scale of animal life is also described: a species of frog in Jamaica, that bypasses the tadpole stage, emerging from the egg as a tiny but fully developed, four-legged frog. This curious animal lives among the rocks on mountain heights where there are no ponds for tadpoles to swim in, so it just about has to get along without the more usual type of frog infancy. Dr. W. Gardner Lynn has made a study of this remarkable animal.

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War Hinders Archaeology

► **EXCAVATIONS** and restorations in the great Maya region in Central America, one of the most characteristic of

Carnegie Institution activities, have been interrupted by the war, and no resumption is expected until peace returns, Dr. A. V. Kidder states. Many of the archaeologists and anthropologists are now engaged in war work where thorough and accurate knowledge of the peoples of tropical war areas is required.

In one area only, Guatemala, has any actual digging been possible. Finds made by private individuals there have also been investigated. Most notable among the latter was a cache containing ceremonial vessels and a gold plaque.

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Stars or Planets?

► **INVESTIGATING** the physical characteristics of the small companion in the compound star known as 61 Cygni, Dr. Henry Norris Russell, research associate at Princeton University, found that the probable size of the body ranged from about the same as that of Saturn to a body with a radius approximately ten times that of the sun—that is, it might be of either planet size or sun size.

The surface temperature of this body, which has a mass about 16 times that of the planet Jupiter, Dr. Russell estimated to be too low to be self-luminous. Shining by reflected light, it would be much brighter than Saturn without its ring, but the planet would still be too faint to be seen from the earth.

Considering not only the invisible companion of 61 Cygni, but also the newly-reported companions to the stars catalogued as Cincinnati 1244 and 70 Ophiuchi, Dr. Russell concluded that the internal constitution of these three bodies is probably more like that of a star than it is like any of our planets. Since these three small celestial bodies, the only ones outside our solar system known to have masses less than one-tenth that of the sun, can at most shine only feebly by their own light, Dr. Russell argued that they shine mainly by reflected light and can rightly be called "planets."

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Star-Obscuring Polar Cap

► **ASTRONOMERS** have frequently noticed that something was dimming the true brilliance of the stars near the north pole. Instead of being in our own atmosphere, this cloud exists in space, between us and the stars. Investigations

conducted by Dr. Frederick H. Seares of Mount Wilson Observatory with the assistance of Miss Mary C. Joyner, showed that this cloud which obscures the polar stars is 20 degrees in diameter. Our own solar system is close to, if not actually a little within, this obscuring matter.

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Light From New Stars

► BETTER to understand the luminosities of "new stars" and their evolution, a study of the expanding shells of some

of the nearer novae was made by Dr. Walter Baade, partly in cooperation with Dr. Milton L. Humason. Comparing a photograph of the "new star," R. Aquarii, taken this year with one made in 1921, Dr. Baade discovered that the outer shell of gas is expanding.

The line of a previously unrecognized element in the sun was identified as neutral gold, through the work of Drs. Arthur S. King and Charlotte Moore Sitterly. Dr. Harold Babcock and Mrs. Mary F. Coffen supported this evidence by observing that the gold line is strengthened in sunspot spectra.

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was retired last spring, has been appointed executive officer of the informational service of the division of medical sciences of the National Research Council. Prof. Ross G. Harrison, chairman of the Council, has announced.

The informational service has been established under a recent grant of the Johnson and Johnson Research Foundation of \$75,000 for the period ending June 30, 1945. The purpose of the grant is to enable the Council to assemble and disseminate as far as possible, medical information pertaining to the war effort. (See SNL, Oct. 23)

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DENTISTRY

Fluoride Reduces Caries

Tests prove that a two per cent solution of sodium fluoride is about 40 per cent effective in reducing the amount of dental decay in a group of school children.

► PUTTING a 2% solution of sodium fluoride on the teeth of a group of school children reduced by about 40% the amount of caries, or decay, in the teeth of these children during the following year, Dr. John W. Knutson, U. S. Public Health Service dental surgeon, and Prof. Wallace D. Armstrong, of the University of Minnesota, report in *Public Health Reports* (Nov. 19), official publication of the federal health service.

Fluorides in drinking water, it was discovered some years ago, will, if present in high enough concentration, cause the ugly tooth condition of mottled enamel. Lesser amounts of fluorides in the water, though failing to cause mottled enamel, apparently protect the teeth against decay.

Efforts to use fluorides locally instead of through the drinking water to control tooth decay have previously been made by other investigators on small groups of children, with apparently some success.

The group treated under the direction of Dr. Knutson and Prof. Armstrong numbered 289. Their teeth were compared at the end of the year following treatment with those of a control group of 326 children in the same schools. Before the treatment, children of both groups had been suffering about the same amount of tooth decay.

Only the teeth in the upper and lower left quadrants of the mouth were treated. There were 39.8% fewer new

carious teeth in the treated than in the untreated teeth at the end of one year. The treatment did not, however, prevent decay from attacking undecayed surfaces of teeth previously attacked by decay. In other words, about 40% of teeth that had no decay or cavities were protected from caries, but teeth that already had cavities or decay spots were not protected. If this is borne out by further studies, it means that the fluoride treatment can prevent decay but not arrest it once it has started. In that case, it probably is a more effective preventive than the 40% figure indicates, because undoubtedly, the scientists point out, some of the new caries developing in the treated teeth had started before treatment but was not far enough along to be detected when the teeth were examined before treatment was started.

The 2% solution of sodium fluoride used is highly poisonous and must be used and guarded with extreme caution, the scientists warn. Whether this is the weakest effective solution and whether eight treatments, the least number given in the study, are more than needed are among questions to be answered by further studies.

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MEDICINE

Former Surgeon General Heads Information Bureau

► MAJ. GEN. James Carr Magee, former surgeon general of the Army who

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GENERAL SCIENCE

Science Speeds War and Post-War

Science Review for 1943 shows mass production of penicillin realized, 100,000,000-volt X-ray produced, the existence of radar revealed, new war weapons developed.

This summary of the year's happenings in the world of science is limited by space to just the highlights. Most of the events are described in detail in the pages of the SCIENCE NEWS LETTER for the current year. If you wish to refer to any particular report you may find it readily through the index. (See SNL, June 26 and also the issue which will appear next week, December 25.)

By SCIENCE SERVICE STAFF

► HISTORY may look back upon 1943 as the year in which mass production of penicillin began or when 100,000,000-volt X-rays were first produced, but the most exciting science news to all Americans working for victory was probably the taking of radar from under its wraps and the revelation of a few of the new science-produced weapons, such as the powerful rocket "bazooka."

More than one successful way of making sea water drinkable by shipwrecked men on life rafts by the addition of chemicals was another important war advance. So was the perfection of a thermal de-icer for airplanes.

Our armed forces made enviable records in returning wounded to active duty, 41% for the Army and 53% for Navy and Marine Corps, thanks to the use of blood plasma, sulfa and other drugs, and quick evacuation.

The sulfa drugs perform "miracles," but the drug from mold, penicillin, promises to be even more effective in disease-combatting when production now underway is achieved and reaches the public as well as the armed forces.

Mexico had a real, live volcano burst forth from a cornfield; Paricutin, still

erupting, is the best observed such phenomenon in history.

Heat resistant alloys good to 1,500 degrees Fahrenheit brought the gas turbine closer to practicality as a new kind of engine for the post-war era.

Scientists and engineers by the thousands continued secret military research, which in many cases will help new industrial production when peace comes.

The detailed annual survey of the year's progress in science and technology follows:

AERONAUTICS

Super-Bomber Developed; 75-mm Gun Put on Plane

► A SUPER-BOMBER, the B-29, which is superior to the B-17 and the B-24 in range, firepower and load, was reported in production.

The 70-ton Martin "Mars," world's largest flying boat, was turned over to the Navy after completion of the last of a series of grueling tests.

The Grumman "Hellcat," a Navy fighter plane which retains the heavier firepower, better armament and leak-proof gas tanks of the "Wildcat" and has increased range, speed, climb, maneuverability, and altitude capacity, went into combat against the Jap "Zero."

Army medium bombers were successfully armed with 75-mm cannon.

Airplane anti-icers, which shoot hot air through ducts on wing and tail surfaces, were perfected and installed on long-range patrol bombers, it was announced.

Formation of ice on propeller blades was prevented by a strip of electrically conductive rubber on one edge of the blade.

Three super-aircraft carriers of 45,000 tons, capable of handling larger multi-engined planes, were authorized and the construction of one started.

A new 24-passenger, twin-engined airplane, considerably smaller than the familiar DC-3, having about half the power and half the cost, was designed.

A new 8-ton Navy torpedo plane, "Seawolf," carrying a crew of three, was scheduled for quantity production.

Powerful rocket jets were reported used by the Germans as auxiliary power to assist heavily loaded planes in the take-off, and experiments are underway in this country.

"Cycleweld," a new process of putting together aluminum alloy, wooden or rubber aircraft parts without riveting or welding but by using a specially prepared cement and applying heat and pressure to the joint, was announced.

An automatic computing sight for aerial gunners was announced as standard equipment for all Flying Fortresses.

The electronic autopilot, which keeps a



INTO ACTIVE COMBAT—The Grumman Hellcat went into the fight against the Jap "Zero" during the current year. Incorporating the fire power and armament of the Wildcat, this Navy fighter plane also has increased range, speed, climb, maneuverability and altitude capacity.

heavy bomber rigidly on its course while approaching the target during high altitude precision bombing missions, was announced.

The flight tray was developed to utilize a cathode-ray tube to read multiple flight instruments and warn the pilot when any instrument deviates from its setting.

The "Flide-Rule," a cross between the airman's flight computer and engineer's slide rule, was developed.

A water-proof, radio transmitter to SOS automatically over an approximate area of 100,000 square miles was developed for use on emergency rafts.

A caterpillar landing gear was developed to enable airplanes to land on rough, soft or sandy ground.

A night landing aid was demonstrated consisting of two lights on the plane and a small convex mirror on the nose of the plane, the lights converging into a single spot to signal approach to the ground.

An airplane windshield that will not ice up and that will stop 15-pound birds collided with at 200 miles per hour was developed.

A new low-level bombsight, which has shown excellent precision at 400 feet, was developed for use in light planes.

A new dual rotation propeller, "contra-prop," with automatic, constant speed, controllable pitch and consisting of two three-bladed entirely self-contained units turning in opposite directions, eliminated the need for special provisions to withstand the force of reaction.

Two new wind tunnels for airplane re-



RECOIL ABSORBED — A secret method of eliminating gun recoil makes possible the successful installation of a 75-mm. cannon in a B-25 Mitchell bomber. (See SNL, Dec. 11) This U. S. Army Air Forces photograph shows a Mitchell with the cannon in the lower section of its nose; two 50-caliber machine guns bristle just above.

search at Pasadena, Calif., and Buffalo, N. Y., went into construction.

A method of changing tires on war cargo transport planes was devised; this cuts the time to less than one hour, instead of a six-man team working three shifts of eight hours.

An arch type steel and canvas airplane combat hangar, 130 by 160 feet, which can be transported by air and erected within a period of 12 to 18 hours, was developed.

Robot planes, or "target" planes of 8-foot span, operated by radio control, were used in maneuvers with ground troops.

The longest parachute jump on record in the United States was made from 40,200 feet, the descent taking 23 minutes and 51 seconds.

ANTHROPOLOGY-ARCHAEOLOGY

Ancient Bronze Strip Describes "World King"

► AN INSCRIBED strip of bronze, indicating existence of a monarch who claimed the title "king of the world" 2,500 years ago, was discovered in Palestine.

Complete human remains, 7,000 to 10,000 years old, were discovered near Abilene, Texas, in a man-made grave of undoubted antiquity.

Human bones estimated to be about 10,000 years old were found in California, thus furnishing a further clue to the appearance of the early North American Indian.

The discovery of a number of important pre-Inca sites in the Cuzco region of Peru was announced in the United States.

Further evidence of the relationship in pottery styles between the mainland of South America and the West Indies, denoting similar culture, was announced.

Records, made public in the United States, indicate that the first human inhabitants of the northern coast of Chile were two separate fishing populations followed by an agricultural culture.

Several hundred priceless pieces of jade, believed to be more than 1,000 years old, were discovered in tombs deep in the jungle of Mexico.

ASTRONOMY

Evidence of Gold in Sun Found; Sunspots Appearing

► EVIDENCE of gold in the sun was obtained by comparative study of gold spectrum lines and the solar spectrum.

Thorium, rare radioactive element, was discovered in the sun by detecting lines in the solar spectrum that matched lines of thorium produced in the laboratory.

The sun entered a new 11 1/3-year sunspot cycle with the first new spot group appearing as expected well away from the sun's equator and one of the last spot groups of the old cycle still visible close to the equator.

New comets discovered were: Diamaca, Oterma III, van Gert.

Periodic comets rediscovered were: Comas-Sola, last seen in 1935; Comet d'Arrest, last seen in 1923.

A nova or exploding star was discovered in the constellation Aquila.

Nova Puppis, discovered in November, 1942, faded below naked-eye visibility.

The shell of the star 48 Librae was found to be composed of separately rotating hot layers.

In February, Comet Whipple II increased its brightness by nearly two magnitudes in a sudden and unexplained manner.

Nitrogen-hydrogen molecules made up of more than two atoms and hitherto unidentified in comets were found by spectrogram measurements to be numerous in the heads of Comet Cunningham and Comet Whipple II.

Possible development of a stationary shell in the old nova, T. Coronae Borealis, was indicated by absorption lines of helium in the spectrum.

One star of the binary Beta Cephei was found to be the brighter member in a double star with a period of 50 years.

The continued existence of galactic clusters like the Pleiades was explained by dynamical friction, tendency of each star to hold back all the other stars in the cluster.

Dr. Ira Sprague Bowen of California Institute of Technology was awarded the Henry Draper Medal for 1942 in recognition of his contribution to astronomical physics.

BIOLOGICAL SCIENCES

Cinchona Plants Sent South; Rat Poison Found

► ABOUT 200,000 quinine-bearing cinchona plants, grown from seeds rescued from the Philippines during invasion, were sent to neighbor republics for planting.

Fresh evidence that virus disease particles are giant protein molecules capable of reproduction and parasitic feeding within living cells was obtained by means of the ultracentrifuge, which whirls solutions at high speeds and separates and sorts the particles.

A strain of mold was induced by X-ray to undergo genetic changes from which were established many pure lines specifically deficient in ability to synthesize dietary essentials; these strains offer new approaches to the study of biochemistry and genetics and have also proved extremely valuable in delicate chemical analysis of food.

Plant tumor bacteria, when deprived of power to cause abnormal growths through use of glycine, regained it when treated with hormones; bacteria from the tumors thus caused were unable to produce new tumors unless again aided by hormones.

A deadly poison, extracted from a microbe in the soil, was discovered as a possible rodent exterminator when laboratory tests revealed it not as a germ killer for mice, but a killer of the mice instead.

A method for cutting muscle slices only 1/100,000 of an inch thick was devised to give the electron microscope a view of hitherto invisible structures involved in nerve-muscle action.

Large-scale use was made of an enzyme formed in mass-cultured mold for the splitting of starch into sugar for fermentation into industrial alcohol.

Special strains of yeast were developed, having nutritious qualities and flavors of meats and other foods.

A new synthesized female sex hormone was developed by combining sulfur with the natural female hormone, estrone.

Prenatal control of sex of fruitflies was accomplished by genetic selection.

Pellets of synthetic female sex hormone, diethylstilbestrol, inserted under the skin of young roosters, made them resemble hens.

Tests and experience of new tillage methods, dispensing with mold-board plows that turn all the vegetation under, proved highly successful.

Successful domestication of a number of useful native grasses, never previously cultivated, to control erosion, improve range lands and provide more livestock food, was reported.

A program to promote the increased growing of cork-oaks in this country to eliminate the future risk of being cut off from foreign supplies was announced.

Night-time temperature was found to affect differently blossom induction and other activities of warm-climate plants and cool-climate plants.

The need for boron in fertilizers to increase plant growth was found to vary according to the type of soil and concentration of calcium and potassium in the soil.

The first natural epidemic on record of vesicular stomatitis among hogs was discovered.

Probably for the first time in history, two brains in one dog were discovered in a routine rabies examination.

The palm swift of Africa was found to build its nest on edge on the nearly vertical fronds of tall palms and fasten the eggs to the nest by a natural glue secreted by the bird's salivary glands.

Dr. Edwin Grant Conklin of Princeton University won the John J. Carty medal and award for the advancement of science for 1943, in recognition of his services to science as zoologist, cytologist, embryologist, philosopher, teacher and scientist.

CHEMISTRY AND PHYSICS

Biotin Synthesized; Dry Milk Vitamin Retained

Biotin, recently discovered vitamin of the B group, was made synthetically, thus affording more ample supplies for research in human nutrition.

A new method of preserving vitamin C in evaporated milk by sealing the evaporated milk tins in an atmosphere of nitrogen or under vacuum was developed which increases by 50% the vitamin C retained after six months storage.

Riboflavin (vitamin B₂), important in the prevention of certain eye and skin diseases, was found to be present in the soil and in a special yeast first isolated from sour milk.

Two important vitamins, riboflavin and thiamin, were recovered in quantity from brewery wastes by the use of an insoluble synthetic resin, Amberlite IR-100.

An inexpensive process for recovering a billion pounds of food protein annually from wheat used for alcohol production was developed.

A process for obtaining large quantities of protein for possible human consumption from a "de-fatted" corn germ was developed.

A concentrated protein extract to be used as a substitute for scarce grain in livestock rations was obtained by chemical treatment of grass.

A method for quicker and cheaper re-

moval of proteins from distillery wastes by use of bentonite, a fine clay, was developed, thus affording valuable protein cattle food.

A sticky starch, used as a substitute for tapioca and for textile sizing and finishing and for paper coatings was made from certain kinds of corn and sorghum.

Wheat gluten, a by-product in the manufacture of wheat starch, was found to make a good adhesive when dissolved in dilute ammonia.

Potatoes, when mashed and kept hot for a period before serving, were found to lose vitamin C rapidly.

Hand-size aerosol dispensers, containing highly compressed Freon gas, a very concentrated pyrethrum extract and some sesame oil, were introduced for protection of the Army from malaria mosquitoes overseas.

Sabadilla, seed insecticide, was processed as a spray for extermination of household and crop insects as a substitute for Japanese controlled pyrethrum.

A simple, inexpensive method of keeping whole milk powder fresh twice as long through the addition of wheat germ oil and edible acids was developed.

A process for obtaining carbohydrates from sweet potatoes for new sugar products was developed by removing water from potatoes at a high temperature and humidity.

Foods dried in a natural gas atmosphere, which is later burned to heat the dehydration unit, retained almost all their vitamin C and original color and taste.

The mechanism by which auxins, hormone-like substances, stimulate plant growth was discovered to be by the release of an enzyme, diastase, from protein colloidal substances.

A new and more economical alcohol process for the recovery of glycerin from fats in soap-making was developed.

A new kind of synthetic rubber, Paracon, was developed which will be valuable as a special replacement for natural rubber, particularly in the aircraft industry.

The extent to which the molecules of substances form crystals was found to determine the difference between springy rubber, a hard plastic and a tough fiber.

An improved vinyl-type plastic, Marvinol, to replace rubber for such uses as inner tubes, surgical gloves and molded goods was made from coal, air, salt and water.

Starch acetate, a new plastic chemical for use as a lacquer and water-resistant adhesive, was made from potatoes.

A water-repellent, invisible film, which prevents water from soaking into such objects as radio insulators was developed by treating the objects with methyl chlor silanes vapors.

A new, more economic fluorescent material, composed of zinc oxide and vanadium pentoxide, was developed which transforms invisible ultraviolet rays into warm yellow visible light.

New war gases, nitrogen mustards, were developed and found to have a milder blistering action than mustard gas and to cause blindness.

For the first time, 100,000,000-volt X-rays, fifty times greater than any previous voltage, were produced.

Radar, a locator using ultra-high frequency radio waves, although developed earlier, was announced.

The smallest "quantum" of energy, the



LIFE-SAVING ALOFT—This U.S. Army Air Forces photograph shows how blood plasma can be administered aboard an Air Transport Command plane.

amount that would be emitted by a single atom making one vibration per second, if that were possible, has been somewhat enlarged by new measurements made by X-rays and agrees satisfactorily with results calculated from the atomic theory.

By shooting invisible infra-red rays through certain organic chemicals, such as fuels and rubber compounds, it was found that high-speed analysis, impurity tests and molecular determinations could be made.

"Heatronic molding," or the heating of plastic objects all the way through at the same time by means of high-frequency radio waves, was made practical for the speedy production of airplane instrument panels, radio housings and other thermo-setting plastic objects.

A speedy, improved method for observing the rate at which metals diffuse through one another to form alloys was developed by heating thin metal films and measuring the amount of light reflected from the film.

A new phosphorescence microscope for the examination of objects by their own short-lived glow after ultraviolet irradiation was devised.

Rhenium, rare chemical element, formerly a German monopoly since its discovery in 1925, was found in dust from the flues of molybdenum ore-roasting plants in a western state.

A huge optical glass disk, the largest prism ever made, measuring 26 inches in diameter, graduated in thickness from one and one-half inches to three and one-quarter inches and weighing 260 pounds, was successfully cast for use in an astronomical telescope.

An electrical director for anti-aircraft artillery that keeps the guns of a battery accurately aimed at all times was developed.

A new type of telephone transmitter,

strapped to the speaker's upper lip and hanging just before his mouth, and a head receiver with soft rubber tubes that enter the outer ear canal, were developed for the use of combat personnel.

Amber colored diamonds were changed to green by bombardment with heavy hydrogen atoms.

The magnitude of the total peak current in a lightning flash was found to have been overestimated in the past.

Dr. George Washington Pierce of Harvard University was awarded the Franklin Medal by the Franklin Institute in recognition of his outstanding contributions in the field of electrical communications and his influence as a great teacher.

Dr. Kenneth S. Pitzer, 29-year-old University of California faculty member, was awarded the \$1,000 prize of the American Chemical Society for his work in chemical thermodynamics.

Dr. Harold C. Urey, Nobelist and professor of chemistry at Columbia University, was awarded the Franklin Medal by the Franklin Institute for his discovery and production of heavy hydrogen.

Prof. Herbert E. Carter of the University of Illinois was awarded the Eli Lilly Award in biochemistry.

Frank H. Shaw, president of the Shaw Insulator Company, won the John Wesley Hyatt Gold Medal and \$1,000 award for his work in the field of plastics.

Dr. Earle O. Whittier, Bureau of Dairy Industry, U. S. Department of Agriculture, won the Borden Award in the Chemistry of Milk.

Dr. John J. Grobe of the Dow Chemical Company was awarded the Chemical Industry Medal.

Gaston F. DuBois, vice-president of the Monsanto Chemical Company, was awarded the Perkin Medal.

Dr. Paul R. Heyl of the National Bureau of Standards won the Howard A. Potts Medal for his theoretically important formula to determine the constant of gravitation.

EARTH SCIENCES

Birth of Mexican Volcano One of Unusual Events

► PARICUTIN, a new volcano 200 miles west of Mexico City, arose from a cornfield to a height of 1,000 feet and is the first whose entire life is recorded scientifically.

Evidence of a long wet spell 120 million years ago was found in fine white clays of the Southwest.

The 250-million-year-old fossil remains of a giant amphibian with a skull more than two feet long were found in Texas.

Legendary pit of Tasco, Mexico, known as Hell's Mouth, was found to be only 500 feet deep instead of a mile; to close the pit and prevent its use as an illegal execution spot, it was dynamited.

Issuance of daily weather maps and fuller forecasts by the U. S. Weather Bureau was resumed when it was concluded that this information would be of less value to the enemy than to our own war efforts and production.

Seismologists located epicenters of 43 distant earthquakes through correlation of seismographic data; notable among them was a double shock off the coast of Japan

in the same region where the disastrous tidal wave of 1933 started.

New deposits of quartz, suitable for use in military radio and radar apparatus, were discovered in North Carolina, Virginia, California and Arkansas.

Ancient ocean beds in Idaho and Wyoming were found to contain vanadium, estimated at millions of tons.

New deposits of the rare metal tantalum, used in surgical, electrical and temperature-control apparatus, were found in New Mexico.

Dr. Columbus O'Donnell Iselin, II, director of Woods Hole Oceanographic Institution, was awarded the Agassiz Medal for 1942.

ENGINEERING AND TECHNOLOGY

"Pancake" Diesel Engines Give More Power to Ships

► THE "pancake" diesel engines now powering Navy ships were revealed to put out more than four times the power per pound of former diesel engines and to occupy only a third the space.

Gas turbines capable of initial temperatures of 1,500 degrees Fahrenheit were made possible by the development of heat-resistant alloys.

A speedy, economical process for food dehydration which for the first time reduced the moisture content to 1% was developed through use of radio-frequency energy.

Copper-covered steel wire for high frequency communication lines was developed and found as efficient as solid copper wire.

Special thick-walled tires built to be run without tubes were produced for Army use.

Tubeless tires completely filled with an anti-freeze solution of calcium chloride as an inner liner for preventing air diffusion were developed.

Speedy continuous tinplating processes, which save much tin, were developed by the use of new and improved chemicals in electroplating.

A new and easier method by which silver can be electroplated on magnesium to prevent oxidation was developed.

A non-skid, fire-proof plastic material containing particles of garnets went into use on battleship decks to prevent slipping accidents.

A new and superior optical glass, made without sand, was developed from common chemicals, such as boric acid, zinc oxide and aluminum hydroxide.

A walnut-sized searchlight, projecting a 1,500 candlepower beam of light visible for 65 miles at sea, was designed.

Colored smokes from grenades aided American tanks in identifying themselves to friendly planes in the Tunisian campaign.

A pre-treatment of plane and glider surfaces before shipment to the aircraft plant by a new lacquer and process cut the "doping" time nearly a third.

A new airplane compass, the Gyro Flux Gate Compass, which is not affected by bombload, motion of the plane, armor plate, or other metal parts of the plane, was developed.

The bazooka, using deadly rocket projectiles with highly brisant explosive charge, was announced as a new war weapon and proved effective in combat.



NATURE EXPLODES—The volcanic Niuafoou, popularly known as "Tin Can Island," seems to be surging upward in its entirety as a giant eruption convulses the tiny islet, which is only six square miles in area. This official U. S. Navy photograph was taken from the air just as the towering smoke rose up over the Pacific.

The Army's new submachine gun, M3, was scheduled to supplant all other weapons of the same type due to performance records and the fact that it can be produced without complicated machine tools.

"Electrical nurses" for the 20-inch pipeline between Texas and the East Coast were developed to record temperature of motors, pumps and bearings, pressure in the pipe and direction of fuel flow.

Cement-water paints were found highly effective in preventing rain penetration through concrete walls.

A complete, faster and cheaper method for mapping strategic areas of this country was achieved by improved stereoscopic plotting of aerial photographs.

Plastic lithographic printing plates, replacing critical zinc and aluminum, were made from polyvinyl alcohol resin for use in printing colored maps and documents and in mobile field printing units.

Washing films and prints, after fixing with hypo, first with sea water and then with fresh water, was found to speed the job in photography.

A compact, easily portable mercury flash lamp outfit which takes photographs with an exposure of only one-millionth of a second was developed.

Chicken feathers were salvaged for camouflage and stuffing material by use of a preservative containing two inexpensive weak acids which prevents decomposition of the wet feathers.

A new device, the "wide-angle photo-electric scanner," combining spinning mirrors and a light-sensitive cell, was designed for use as an industrial safety and inspection device.

A new gage which uses mirrors and a ray of light to adjust the sights of a Garand rifle in less than two minutes without firing a shot was designed.

Thermostats, metal disks the size of a silver dollar, were used as a fire-protection in warplanes.

A speedier, more economical method for making gears for military vehicles was developed by precision forging them on presses without the usual machining.

A radio frequency gun for spot gluing of wood was developed.

Stainless steel sheets were stitched together with an electric "thread" or current which shoots clear through the metal and fuses the sheets together at their inner surfaces.

The Alcan Highway was opened after a year's work in which airplane reconnaissance found a way through and engineer regiments with "guts and tractors" and other machinery built the road.

Alloys for steam temperatures of 1,800 degrees Fahrenheit improved waste disposal systems.

Developments in metal cutting have greatly increased the output of milling machines.

A Committee on Biomechanics of the American Society of Mechanical Engineers was organized to study safety in airplane design.

Charles F. Kettering, vice-president in charge of research for General Motors Corporation, was awarded the John Fritz Medal.

INVENTIONS

Many of Year's Inventions Designed to Aid Allies

► NOTABLE and interesting inventions patented during the year include:

A radiolocator, for locating remote objects, which makes use of only a single detector in place of the two or more in existing systems.

An electromagnetic probe for locating metal fragments in wounds.

A weed-killing machine that uses flame from pressure oil burners instead of steel blades.

A machine for large-scale cultivation of mold used in production of alcohol for smokeless powder and synthetic rubber.

A wide-angle periscope for tanks which provides a wider view of the horizon and enables quicker aiming of guns.

A powerful wire cutter, adapted either for getting through barbed-wire entanglements or for the work of electricians, riggers and fencebuilders.

A method of obtaining valuable chlorine as a byproduct of the potash industry through use of silica catalyzers.

A more compact oxygen mask for flyers practically incorporating in the mask a re-breathing bag where fresh oxygen is diluted with already-breathed air.

An infra-red de-icer for preventing icing on plane wings and propellers.

A glider torpedo, traveling at a prede-

termined angle and a constant speed, to be projected from fast-moving airplanes.

A device that turns a fencepost or tree stump into an anti-aircraft mount for the .50-caliber machine gun in less than half a minute.

A cheaper, safer hand grenade the size and shape of a baseball which uses the centrifugal force of the throw to set off the fuse.

A demolition explosive which will break completely through metal objects without mud or dirt stemming.

An amphibian pontoon bridge, which is towed over land on its own wheels.

Cosmetics and an ointment for burns or other flesh injuries that contain an extract from yeast which stimulates cell respiration and growth.

Use of solid strands of nylon-type plastic in tires replacing cotton and rayon cords.

A method of coating individual seeds with adhesive envelopes containing fertilizer, nitrifying bacteria, fungicides, etc., to make them more efficient.

A nearly transparent airplane for photographic and observational work made of a skeleton framework of metal filled in with plexiglass.

An improved method of chilling meat in large pieces to make it better and keep it from spoiling.

A simplified, light-weight air-conditioning unit for small houses, which chills the water from city mains and passes this chilled water through coils to cool the air.

An egg incubator with correct-time-interval turnings based on embryological study of the chicken.

MEDICAL SCIENCES

Medical Advances Combat Disease at Home, Abroad

► HOPE of a penicillin conquest of venereal disease was held out by reports of cures of syphilis and gonorrhea by this safe, potent chemical from molds which has also been reported effective in treatment of gas gangrene, osteomyelitis and other staphylococcal infections, empyema, pneumococcus pneumonia and hemolytic streptococcal infections.

A new drug for fighting malaria which is sufficiently promising to be worthy of trial under field conditions, was announced by the War Department, though the name of the drug was not released.

"Continuous caudal analgesia," which banishes the pain of childbirth by means of continuous injection near the base of the spine of a pain-killing chemical, metyrcaine, was announced and said to give promise of further surgical usefulness for war wounded.

Possibility of using chicken serum to develop vaccines to protect against, or antisera to cure, certain virus diseases, such as virus pneumonia, parrot fever, trachoma and lymphogranuloma venereum, was suggested by announcement of a chicken antiserum that definitely protected mice against a virus pneumonia.

Folic acid, one of the new B vitamins, was found to have an important role in blood cell production in studies showing it cured anemia and agranulocytosis induced by sulfonamides in white rats and that lack of it in the diet caused agranulocytosis in monkeys, anemia in chickens.

Thiamin, vitamin B₁, was discovered to be manufactured by the intestinal bacteria of humans, a finding likely to change earlier views of vitamin requirements.

Two 24-hour sulfa drug cures for impetigo were announced, one using sulfadiazine in a jelly that gives a plastic coating and needs no bandage, the other using microcrystalline sulfathiazole.

A method of creating nerve banks, constituting a supply of quick frozen and dried nerve fragments for nerve grafts, was developed and found successful in laboratory animals with clinical use as a future possibility.

The first clinical use of nerve grafts from cadavers with acacia used to glue the graft in place was reported with good results in the first two cases.

The production of safe vaccines against two types of encephalitis, or sleeping sickness, the St. Louis and Japanese B types, effective, according to blood tests, in half or more of the vaccinated, was announced.

A specially treated cotton, oxidized cellulose, which is safely absorbed by the body, was found to aid in stopping bleeding during operations on the brain or elsewhere when the material was soaked in blood-clotting thrombin, and gave promise of further medical and surgical usefulness.

The use of plasma, sulfa drugs and other drugs and the technique of quick evacuation of wounded to advanced surgical centers accounted for the return to active duty after hospitalization of 41% of United States Army war wounded, and 53% of Navy and Marine wounded.

The United States Army with the aid of vaccines won an almost 100% battle for its overseas troops in combatting diseases, of which the typhus victory is especially noteworthy.

A second, more potent weapon against disease germs, penatin, was discovered in the same mold which yields penicillin.

Chemical methods were developed for taking salt out of sea water and making it drinkable.

Large scale production of penicillin, germ-fighting chemical remedy from mold, was started, aided by development of two more productive strains of the mold and use of fermentation as well as surface culture methods of growth.

As a current make-shift method, the utilization of gauze saturated with culture medium in which the mold was growing permitted the application of penicillin to open wounds.

A major factor in causing sterile marriages and stillbirths was traced to incompatibility of the parents with regard to a newly recognized blood factor, Rh, and a method of distinguishing couples who are doomed to childlessness from this cause from those who have a chance of having some normal babies was developed.

New triumphs reported for sulfa drugs included: speedy recovery of shipyard eye (epidemic keratoconjunctivitis) by sulfathiazole desoxyephedrine treatment; controlling scarlet fever epidemics by sulfadiazine; and preventing epidemic diarrhea of the new-born and curing "babies' sore eyes" due to gonorrhea by succinyl-sulfathiazole.

A new sulfa drug, desoxyephedronium sulfathiazole, reported to bring prompt relief in colds and to shorten their duration, and the prevention of ear and sinus infections after a cold by a sulfadiazine spray were announced.



NO STRAIN—Wounded service men can enjoy a game without sitting up or having the cards slide away, thanks to a simple ingenious stand being turned out by boys and girls of the Junior Red Cross. The stand, built entirely of non-critical materials, has the edges of the vertical strips chamfered so that cards are held lightly but firmly. Patent rights for the stand, designed by R. D. Paxton, who instructs shop work at Oak Park High School of Chicago, are held by the American Red Cross. The board is not available for civilian use at present.

New sulfa drugs which were developed include: phthalylsulfathiazole, for treatment of intestinal infections such as dysentery and sulfamerazine, for pneumococcus pneumonia, meningitis, gonorrhea and streptococcus infections.

Two possible anti-influenza weapons suggested by tests on laboratory animals were inhalation of small concentrations of triethylene glycol vapor in air and by inhalation of a globulin fraction of influenza immune horse serum.

New methods of nerve repair and grafting, developed but so far used only in animals, were: use of an artery cuff to guide the blind growth of fibers from cut nerves in nerve splicing and use of a sliding sleeve extension made out of a stump of the severed nerve for the same purpose.

Repair of skull injuries by plates of tantalum, rare metal which is strong, light weight, easily malleable, does not corrode, is not poisonous and does not cause foreign body reaction, and use of tantalum wire for suturing nerves and tantalum foil wrappers to keep regenerating injured nerves free from scar tissue were reported.

Initial success of a new method of treating goiter by medicines instead of by surgical operation was announced using the medicines, thiourea and thiouracil, which have the unique property of inhibiting the function of the thyroid gland, actually, it is believed, preventing production of its powerful hormone.

A method which simplifies treatment of diabetics and gives better control of blood sugar was developed by mixing two forms

of insulin, slow-acting protamine zinc insulin and rapid-acting regular insulin.

Banishing toothache due to exposed dentin, common cause of dental pain, and desensitizing sensitive areas in the filling of cavities were reported to have been achieved by a new sodium fluoride treatment.

Red blood cells, formerly a waste by-product in the large-scale production of blood plasma, were salvaged and used successfully in place of whole blood in the treatment of anemia and, when dried and powdered, to hasten wound healing.

The right of the U. S. Food, Drug and Cosmetic Administration to set standards of identity for enriched food was upheld by decision of the U. S. Supreme Court.

Treatment of burns with a new plaster cast method, which stops pain, rests and protects the burned part from further injury, prevents swelling and slowing of the blood circulation in the burned area, showed good results in clinical cases.

Innovations developed for aiding in skin grafting included: refrigeration anesthesia of the area from which the skin is to be taken; use of a dye, sodium fluorescein, injected into a vein to indicate when the circulation has been established in the graft; and use of a chessboard pattern, sticky paper method to fix small bits of skin for grafting over a large area.

In the search for a morphine substitute without addiction property, relief of intractable pain in patients with inoperable cancer was obtained by three chemicals, known for short as M3, M4, and M7, developed following the lead of female sex hormone synthesis.

Successful methods for preventing and treating a serious war ailment of shipwreck victims, immersion foot, were developed by Royal Canadian Naval Medical Officers.

Presence of glutamine, essential for the growth of certain bacteria and also important in nitrogen metabolism of animals, was demonstrated in the blood and spinal fluid of man and other animals and a quantitative method for its determination in these body fluids was developed.

Discovery of a substance that specifically attacks the Islands of Langerhans and produces permanent experimental diabetes, was announced.

Patients with duodenal ulcer, as compared with normal individuals, were found to excrete in their urine smaller amounts of a substance that inhibits gastric secretion and may be important in the pathogenesis of the disease.

Fish juices as a substitute for water for shipwrecked men in lifeboats were found to maintain life for protracted periods without danger to health.

A new acid treatment, racemic glutamic acid added to normal diet over long periods of time, was reported effective in warding off epileptic convulsions.

Prevention or cure of seasickness in three out of four cases by pink pills developed by the Royal Canadian Navy was announced, though the formula is a military and naval secret at present.

Effectiveness of sulfa ointments in treatment of skin infections and wounds was increased by adding to the base of the ointment ordinary water and a slightly alkalized chemical.

Sulfathiazole was reported as a speedy cure for trench mouth and the sore throat that often accompanies it.

A method of extending the usefulness of sulfa drugs, consisting in interacting iodine with the sulfa drug, was discovered.

A chewing gum containing sulfadiazine was developed as a possible remedy for severe sore throats.

Possible substitutes or supplements for blood plasma in treating shock from hemorrhage suggested by laboratory tests on animals include solutions of amino acids and hydrolyzed proteins from either beef blood plasma or casein, the chief protein of milk, and beef blood plasma alkalinized for a short time to destroy the antigens.

The injection of a special egg-nog directly into the intestines of patients undergoing abdominal operations was found by Russian military surgeons greatly to lessen shock and often to save life.

A new synthetic hormone, octofollin, was developed and used without ill effects to relieve menopausal distress.

A new chemical, diasone, was announced as a promising remedy for tuberculosis.

Structural details of the syphilis germ, *treponema pallidum*, were made visible for the first time by pictures taken with a new electron microscope, at an enlargement of 9,000 diameters, and the resulting pictures then given an additional ten-fold enlargement.

Faster recovery from infantile paralysis was reported to follow use of the drug, prostigmine, which relieves the excessive muscle tone or tension and the muscle spasm and also reduces incoordination in cases with not too severe involvement.

Discovery of a fear-and-worry chemical

in the blood, as yet unidentified but believed responsible for physical changes resulting from emotional upsets, was announced.

Encouraging results in cases of advanced syphilis followed treatment by a new series of bismuth compounds, such as dihydroxypropyl bismuthate, which were taken by mouth instead of intramuscular injections.

Dicumarol was declared to be apparently effective in preventing post-operative thrombophlebitis and pulmonary embolism.

During the Tunisian campaign, certain evacuation hospitals returned 60% of the neuropsychiatric casualties to full combat duty within four days of admission; of these returned men, 89% performed effectively.

The incidence of pilonidal disease was believed to be increased in the armed forces because of the trauma occasioned by riding in jeeps and tanks.

Intravenous administration of fluorescein was used as a means of measuring arterial obstruction and efficiency of arterial blood flow in occlusive peripheral arterial disease.

Danger of injuring the brain by the fast treatment of syphilis with large doses of arsenicals may be decreased through use of chalcone, a chemical from lemon peel, experiments suggested.

Arsenical treatment for syphilis, amebic illness such as dysentery and trypanosome diseases like sleeping sickness, may be made safer by the use of a vitamin, paraaminobenzoic acid, it was reported.

Seven vitamins, sister vitamins, were discovered for biotin, believed by some to play an important role in cancer.

Diet was linked to malaria by the discovery that chickens and ducks deficient in the vitamin, biotin, developed a more severe type of malaria than did fowl on a normal diet.

Carrots were found to prevent ill effects of high altitudes in experiments on animals.

Incidence of two vitamin hunger diseases, beriberi and pellagra, was reported to have decreased through enrichment of white bread and flour with niacin and thiamin.

The practical utility of pine-needle tea as a source of vitamin C, the scurvy-preventer, was announced by Russian botanists.

A new, unidentified disease, bullis fever, thought to be transmitted to man through tick bites, was discovered and reported to be increasing in frequency and severity in the San Antonio area.

A new, speedy, low-cost pregnancy test, using rats instead of rabbits as test animals, was developed.

Recovery from severe burns is decisively influenced by the surrounding temperature during the first 24 hours, the most favorable temperature being about 75 degrees Fahrenheit, laboratory tests with animals showed.

The danger of jaundice in persons who get human blood serum for transfusions or protective inoculations might be averted by ultraviolet irradiation of the blood or serum, experiments showed.

Treatment for shock in extensive burns, which in man is the cause of 60% to 80% of the deaths within the first few days, was reported successful in laboratory tests by use of a salt water drink.

A new, finely equipped cancer clinic was

opened in Guadalajara, Mexico, during the first Mexican Cancer Congress.

Dr. Florence Seibert of the Henry Phipps Institute, for her research on the chemistry of tuberculosis, won the first \$2,500 Achievement Award, established by the American Association of University Women.

Dr. Charles B. Huggins, University of Chicago professor of surgery, was awarded the first Charles L. Mayer Award of \$2,000 in recognition of his work on endocrine control of prostatic cancer.

The \$1,000 annual award by Mead Johnson and Company for researches on the B complex vitamins went to Prof. Vincent du Vigneaud of Cornell University Medical School and associates for their work on the structure of biotin.

PSYCHOLOGY AND PSYCHIATRY

Sustained Strain Found To Cause War Neuroses

► SUSTAINED physical and mental strain caused a group psychiatric war malady, "Guadalcanal neurosis," treated with quiet, food and absolute rest, while terrific but brief strain as in the sinking of the aircraft carrier Wasp caused no neurosis, not even panic.

A chip-on-the-shoulder defensiveness of men from crowded districts of some large cities as well as some rural regions, "Brooklyn syndrome," was identified and differentiated from psychopathic personality.

Because most people cannot recognize their own handwriting, silhouette, or voice, an individual's criticism of these expressions provided a new method of exploring the unconscious.

War neurosis, caused by strong emotional conflict between self-preservation and duty, was found to be the most common mental casualty.

The tendency of white rats to have convulsive seizures in response to loud tones did not seem to be inherited in any simple way.

Several methods of group psychotherapy were developed, especially for use with war patients.

A feeling of inferiority was found to be associated with high intelligence and social pressures, and is not necessarily due to actual inferiority.

Fatigue was objectively measured by the period of time an individual could continue to feel the vibration of a special tuning fork.

Red goggles were developed with which eyes can be adapted for night vision more quickly in a lighted room than in complete darkness.

Undernourished children, under 4 years, score as much as 18 points higher on IQ tests after they have been given an adequate diet.

Chemicals widely used in birth control were found in animal experiments to affect adversely the intelligence of young later born.

More than 40 Rumor Clinics for the tracking down and analysis of wartime rumors were established throughout the United States and Canada.

That morale is not a single trait but is composed of several relatively independent

factors was indicated by a survey of the effects of war on 2,000 high school pupils; 12 such valid components were identified in another study of 2,539 persons.

The activity in single fibers of the auditory nerve of cats was recorded, the results thus obtained supporting a "place" theory of hearing.

The discovery that the pitch of a tone in one ear can be changed by introducing a tone of the same frequency in the other ear has important implications for a theory of hearing.

Persons whose hearing fatigues most rapidly were found most likely to have it permanently impaired by loud noises; a discovery which makes it possible to decrease the danger of "Boiler-Makers' Deafness."

The fact that rats apparently hear octaves, as we do, was shown when animals trained to run to food when a tone of 10 kc. sounded, were more likely to run on 5 kc. than on 4 or 6 kc.

Adaptation to a bitter taste was discovered to increase the sensitivity to sour and salt, and sometimes to sweet.

Headlines emphasizing the bad news were found to stimulate action in the war effort more effectively than rosy headlines.

Analysis by psychologists of Japanese propaganda appeals led to recommendations to our government for counter-propaganda.

That anti-semitism is an important problem for the United States was indicated by a national survey showing that over 50% believe that "the Jews have too much influence in this country."

Zoot-suit riots brought to attention a complex youth movement composed of three different groups, only one of which is of the delinquent gang type.

The war brought about conditions such that half a million children under 16 were working part or full time.

A "plague of questionnaires" which developed as an attempt of Government to consult the public directly, was relieved by scientific study of all government questionnaires and the application of psychological techniques to make them more useful.

Persons remember the substance of learned material better than its exact form, it was found, but the curve of forgetting for substance and verbatim learning are similar in form; rapid forgetting at first, and less as time goes by.

Courses in "How to Study" were discovered to be of value for average students, rather than for the superior or inferior.

Changes in the pupil of the eye were found to betray when a person is lying, but it is not a reliable test.

Newts were found to be unable to adjust to an upside-down world, thus differing from humans, who become adapted time goes by.

Science News Letter, December 18, 1943

AGRICULTURE

200,000 Cinchona Plants Sent to Neighbor Republics

See Front Cover

► ABOUT 200,000 quinine-bearing cinchona seedlings, grown from seeds rescued from the Philippines during in-

vasion, have been sent to neighbor republics for planting, Benjamin Y. Morrison, principal horticulturist in charge of plant exploration and introduction at the U. S. Bureau of Plant Industry, announced recently.

The picture on the cover of this SCIENCE NEWS LETTER, taken by Fremont Davis, Science Service staff photographer, shows some of the cinchona seedlings growing on a greenhouse bench at the Department of Agriculture research station at Glendale, Md.

Dr. Arthur Fischer, now a colonel in the U. S. Army, is the man responsible for this quinine pioneering, having worked for years with cinchona in the Philippines. After invasion, Col. Fischer flew back to the islands to bring out the high-quality seeds that had been accumulated there. These were delivered with great care and secrecy to the U. S. Department of Agriculture.

Together with a second shipment that arrived later, these seeds will assure up to 2,500,000 cinchona plants.

Seeds sown in the great greenhouses

of the Bureau of Plant Industry were ready within six months to be flown to various countries in Latin America where they should grow well.

"These shipments represented something special," Mr. Morrison said, "in that the plants had been raised for airplane travel. The seeds had been sown on screened sphagnum moss and then transplanted into moss for growing on to shipment size, which is about an eight-inch height."

The moss not only has a very light weight for shipping, but does not allow growth of any of the common organisms that cause "damping off," the worst enemy of seedbeds.

Plants are now growing in Puerto Rico, El Salvador, Nicaragua, Ecuador and Peru. More hundreds of thousands are being readied.

"At the present time," Mr. Morrison reported, "while we promote the former routines, we are pushing ahead on various adjustments that need to be made because certain supplies are no longer available."

Science News Letter, December 18, 1943

Do You Know?

The tail of a *comet* always points away from the sun, due to radiation pressure.

Bituminous *coal* is the source of about one-half the mechanical energy produced in the United States.

First knowledge of cosmic rays came through the discovery that atmospheric air can conduct electricity.

Fresh *fish* may be recognized by its firm and elastic flesh, scales that cling to the skin in most species, reddish gills free from disagreeable odor, and eyes bright and full.

More than four times as much 100-octane aviation *gasoline* is produced now as 18 months ago; with new equipment soon ready for use nearly twice today's production will be possible.

Ancient Romans obtained *copper* from Cyprus Island, now a British stronghold in the eastern Mediterranean, called it "aes cyprium," from which the names of both Cyprus and copper are derived.

Japan is reported to be making *cloth* for military uniforms from Manila hemp; the hemp is cut into very short pieces, treated with caustic soda, mixed with paper pulp, and twisted into a thread.

A new type of aircraft *propeller* has a core of metal with a covering of hard rubber into which bubbles of gas have been blown; over this hard rubber sponge is a shell of rubber and neoprene, polished and lacquered.

The *leech*, used in enormous numbers a century ago as bloodsuckers in medical practice, withdrew about a half ounce of blood which it stored in its many crops or stomachs, and on which it could live for a year.

The deeper note of the *buzz* of the male mosquito (*Culex pipiens*) is due to the rapidity of the wing-strokes, while the shriller buzz of the female is due to the vibration of the tense membranes at the openings of some of the breathing tubes.

SAFETY

Safety in the Army

► SAFETY for soldiers and safety for shop workers on Army equipment were discussed by Maj. Ralph W. Applegate stationed at the War Department, Washington, D. C., at a recent meeting.

"Safety is the fundamental component of all training activities," he said, speaking of the training of soldiers. "The number of safety devices employed by the Army runs into millions."

"It is, of course, evident that the primary function in combat safety is to acquaint our troops with the handling of guns, planes, tanks and other equipment in order that they may insure their own safety from attack and from accidents. Safety in the construction of these weapons is also vital."

"One of the largest jobs during the training period," Major Applegate continued, "is to condition the soldier mentally for his own safety during combat."

The soldier is taught how to handle himself in actual battle conditions by training in simulated battles accompanied by full battle sounds. He is taught how to protect himself from enemy attack in every practical way. He is taught the sounds of approaching planes, bombs and shells, and how to take cover

for his own safety. He is taught how to handle rifles and other equipment safely. He is acquainted with all types of booby traps and mines the enemy might use.

The number of safety measures incorporated into the construction of all types of projectors and ammunition is amazing, Major Applegate declared.

Shells are equipped with special safety devices so that the fuse will not be energized while the projectile is still in the barrel. Aerial bombs are provided both with an arming wire and an arming vane. The combination prevents a bomb from exploding until it has fallen a prescribed distance. Tank drivers find their way by the use of 180-degree revolving periscopes. Tank heavy guns are equipped with recoil guards to prevent injury to the crew by recoil action.

The Army, appreciating that industrial accidents slow up war production, has organized a safety program to apply to plants with Army contracts. Several hundred inspectors are already visiting war factories. Among them are trained safety engineers and others who have received accelerated training under these engineers.

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SAFETY

Lightning Welds Soldier Into His Sleeping Bag

► THE SAD CASE of a soldier who was welded into his sleeping bag by a bolt of lightning striking the zipper is among the odd accidents occurring during 1943. A round-up of accidents by the National Safety Council shows unusual as well as orthodox ways of getting hurt.

Huddled in a foxhole in the Solomons, a private skilfully dodged enemy shot and shell. But a stray bullet dislodged a coconut from a tree limb overhead which fell kerplunk on the private's left leg, breaking it. This was the Army's first coconut casualty, according to Paul Jones of the National Safety Council.

A city-bred horse in Detroit, well-behaved in the heaviest auto traffic, ran away and wrecked the buggy when he met a disturbing sight—another horse.

A rancher in Washington state had a run-in with his reaper. The spinning rod caught his overalls and tossed him into the air. When he landed, he was clad in shoes and eye glasses.

During a hard-fought foot-ball game in Chicago, none of the players on either high school team was hurt. But as a touchdown was scored, an overjoyed substitute on the bench yanked his coach's arm so violently that his left shoulder was dislocated.

The safe way to handle matches was being demonstrated in a junior high school class in Oklahoma. "First, remove the match," the professor explained, "then close the container." As he flipped open the container to demonstrate the wisdom of these directions, all the matches caught fire. When his burned hand had been bandaged, he closed the lecture with these words of warning, "That, students, is what happens when one becomes momentarily careless."

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AERONAUTICS

Parachutists' Hatch Devised for Plane's Tail

► FIRST MOMENT of serious danger to a parachute jumper comes just as he leaps through the door in the side of the plane. There is always a chance that his parachute, opening prematurely, may foul the tail assembly, not only killing or seriously injuring himself but perhaps causing the plane to crash.

To eliminate this hazard, T. W. Swiech of New York Mills, N. Y., has

designed a hatch with sliding doors for the tail of large airplanes. Parachutists leaving through such an opening would immediately be completely in the clear, he points out. Patent No. 2,335,090 has been issued on this invention.

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AERONAUTICS

Veteran Army Airplanes Used in High Schools

► VETERAN airplanes and parts, retired from the Army because of old age,

will serve as instructors in the nation's high schools.

As a part of Civil Aeronautics Administration pre-flight aeronautics program, they will be used to train boys in the upper grades of high school for service in the Air Forces, and at the same time, to condition all high school students for life in an air age.

Requests from 737 schools, in every state except Florida and Arkansas, are already being handled. Classrooms have received 59 airplanes and 226 engines.

Science News Letter, December 18, 1943

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Today the man who needs your dollars is fighting in some distant corner of the world—in his hands may be one of the binoculars Bausch & Lomb is supplying to the armed forces. Your dollars, invested in War Bonds this month, will help equip him and others like him with these vital instruments of war.

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follow. On the battle front, Army officers direct the crushing onslaught of their tank crews with the help of brilliantly sharp views of the enemy line—seen through their Bausch & Lomb Binoculars.

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PUBLIC HEALTH

Influenza Cases Increase

➤ INFLUENZA cases nearly doubled throughout the nation during the week ending Dec. 4, reports from state health officers to the U. S. Public Health Service show. The total number of cases reported was 4,484 as compared with 2,465 for the week ending Nov. 27.

The total number of cases reported probably does not nearly represent the actual number of cases. Reports on influenza are never as accurate as reports on other communicable diseases such as measles, diphtheria, scarlet fever and the like. The reason is that diagnosing influenza and distinguishing it from a bad cold is difficult.

During an epidemic many persons become influenza-conscious and more cases may be reported as influenza than otherwise would be. More persons are likely to call a doctor, fearing influenza. Doctors are so busy, during epidemics, that they may not get around to reporting cases promptly to the health department, when the epidemic is not of a quaran-

tinable disease such as scarlet fever or diphtheria.

In Washington, for example, the official report for the District of Columbia gives four cases of influenza. Unofficial estimates place the number as high as 8,000 for the same week, Dec. 4.

High figures on the official reports came from Texas, with 1,298; Virginia, 651; South Carolina, 453; Arizona, 313; and Colorado, 238.

New England and Middle Atlantic states apparently have not yet felt the epidemic. Highest number reported from these regions was 52 from Connecticut. The disease is not reportable in Massachusetts, New Hampshire, New York State exclusive of New York City, and Pennsylvania, but when it becomes epidemic these states start reporting cases. Of these states, Massachusetts reported one case, New York 14 and Pennsylvania five, during the week ending Dec. 4.

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caused the epidemics in 1936-1937 and 1938-1939. Another influenza virus, named B, caused an epidemic early in 1936 and another in 1940. At least one other influenza virus, and possibly more than one other, is believed to exist.

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ORDNANCE

New Model Jap Rifle Found Inferior to Garand

➤ JAPAN'S new infantry rifle, captured specimens of which have been received at the War Department, may be an advance over the nearly 40-year-old .25-caliber model it supersedes, but tests at the Aberdeen Proving Ground indicate that it is still far behind the Garand with which American forces are armed.

The new Japanese weapon is of the same caliber as the British Enfield, .303 inches; thus it is larger by a split hair's breadth than the American .30 caliber small-arms. This gives the bullet better ballistic properties at medium and long ranges than the too-light .25-caliber projectile. However, the tests indicate that the Jap rifle's accuracy is not dependable at ranges of more than 350 yards. Also, the action is still of the hand-operated bolt type, making its fire much slower than that of the lightning-quick self-loading Garand.

Another Jap infantry weapon tested at Aberdeen is the light machine gun. Its rate of fire is very fast: it can empty its 30-shot magazine in three seconds. However, its lack of means for keeping up sustained fire for more than a three-second burst handicaps it in comparison with the belt-fed light machine gun used by American troops. Again, the Japanese light machine gun is accurate only at short ranges; at 500 yards and up its American "opposite number" beats it.

Ordnance Department officers and specialist troops at the proving ground have thus far tested out about 600,000 captured enemy weapons, representing approximately 1,100 separate types. Weapons are checked not only for such qualities as accuracy and rate of fire, but also for their effectiveness against American tanks and armored vehicles. After being tested, the weapons are sent to American training centers, so that our troops may get acquainted with enemy materiel before they have to oppose it in action.

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PUBLIC HEALTH

Caused by Type A Virus?

➤ THE PRESENT influenza epidemic may be due to the influenza A virus, it appears from studies reported by Miss Minnie Thigpen and James Crowley, of the influenza laboratory at the Minnesota Department of Health. (*Science*, Dec. 10)

They have been able to isolate and identify this virus, they report, from untreated, unfiltered throat washings, 20 of them collected in the current epidemic, by inoculation within the allantoic membrane of developing chick embryos. This is a new quick method of obtaining the virus from human patients.

Previously it was necessary to inject nose and throat secretions from humans into ferrets, and then inject their secretions into mice before the influenza virus itself could be isolated. Use of this new, quick method which seems likely to help speed diagnosis of the disease has also been reported by an Australian scientist, Dr. F. M. Burnet.

Identification of the virus as influenza A was made by the red cell agglutination-inhibition test devised by an American scientist, Dr. G. K. Hirst, at the Rockefeller Institute.

Influenza A virus is said to have

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SCIENCE NEWS

EMBRYOLOGY

Speed Breeding for Fur

Use of artificial light during dark winter months speeds up the development of the embryos in martens and some other fur-bearing animals of the weasel family.

► THE LONG and uncertain period of gestation in certain fur-bearing animals of the weasel family may be materially shortened by the use of artificial light, experiments conducted at Swarthmore College by Prof. Robert K. Enders and Oliver P. Pearson have demonstrated. Fur farmers, now doing their utmost to increase the supply of furs for aviation and arctic-alpine uniforms, are keenly interested. The research was carried out in collaboration with the U.S. Fish and Wildlife Service.

The success of Professor Enders and Mr. Pearson in shortening the time of waiting for the young to be born is based on certain basic facts in embryology. In all mammals, the union of male and female sex cells after mating is followed by an initial period of rapid cell division, at the end of which the early embryo consists of a hollow sphere of cells, called the blastocyst.

At this point, the blastocyst attaches itself to the wall of the mother's uterus, from which it will draw nourishment until birth takes place. This process is known as implantation.

The two Swarthmore researchers discovered that in some fur-bearers of the weasel tribe, the embryo develops as far as the blastocyst stage, and then stops, often for many weeks, before implantation and further growth takes place. This is notably the case with the marten, which mates in July and August

and normally does not give birth until April.

Professor Enders and Mr. Pearson produced shortening of three or four months in the pre-birth period by artificially lengthening the lighted hours in the female martens' quarters with electric lamps. The delay in implantation was eliminated, and the young were born late in December.

Somewhat similar results were obtained with mink. The period of gestation in this animal is very variable, lasting from 41 to 76 days. This variation is thought to be due also to a delayed implantation of the early embryo. By artificially increasing the length of day, the gestation period in the mink was shortened an average of about three days.

The Swarthmore zoologists suggest that the long pause in embryonic development in these animals under natural conditions results from the shortening of daylight hours in the autumn, and that implantation and completion of the prebirth process is stimulated by the lengthening of the daylight periods in spring.

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NUTRITION

Home-Made Soups Help Fill Out War Time Diets

► THE HOUSEWIFE who is thrifty about her ration points will take a tip from a new book on foods and learn or re-learn the art of making soup. The book, which contains much other valuable information is *An Introduction to Foods and Nutrition*, by Henry C. Sherman and Caroline Sherman Lanford (Macmillan). It is written as a simple text-book for those who wish to study the subject, but is easy to read and full of practical suggestions and directions that housewives will welcome.

Soup, it is pointed out, can be more than an appetizer for lunch or dinner. For one thing, it is an excellent way to use all sorts of left-overs which in wartime cannot be thrown away. The last bit of nourishment can be gotten from bones and vegetable parings by adding

them to soup. The water in which vegetables are cooked will contribute flavor, vitamins and minerals. The latter are too precious to waste by throwing the cooking water down the drain.

There are not likely to be many meat scraps left these days, but if there are, they might go into the soup kettle if the family is tired of croquettes, hash and the like. Left-over fish can be made into a chowder that will be more than an appetizer and can serve as a main dish for lunch, or supper if the dinner is eaten in the middle of the day.

Cream soups are especially nourishing because of the milk they contain, and they are a good way of serving milk to those who do not like it as a beverage by itself. Cream of tomato and cream of mushroom soups are popular, but almost any other vegetable, including spinach, can be used for a cream soup. This is another good place for the water vegetables have been cooked in. A combination of several of these pot liquors gives variety of flavoring. A tiny bit of left-over gravy, too little to make a tasty soup when diluted with water, will add flavor and nourishment to a cream soup.

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The Quartermaster Corps is rebuilding about 500,000 pairs of Army shoes a month.

Bears, wolves, foxes and wolverines are causing considerable damage in Norway; their numbers are greatly increased because Norwegian farmers have been stripped of all firearms by the Nazis.

BOOKS

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American Christmas Plant

► MOST OF our traditional holiday plants have stories of Christmas use that are as old as Christmas itself; even older, for evergreen boughs and holly and mistletoe were a part of the pre-Christian Yule feast of northwestern Europe that was bodily taken over and incorporated into the Christian calendar by the wise and adaptable missionaries who conquered that part of Heathenesse for the Cross.

But the poinsettia is a new thing, comparatively, for it is strictly an American plant, native to Central America and the moist tropics of Mexico. It was introduced into the United States only a little over a century ago, by J. R. Poinsett, then our Minister to Mexico. So solidly has it taken hold, even in that relatively brief time, that now it seems

as if it has always been part of the Christmas color scheme in this country.

Although its horticultural name is a deserved compliment to the man who first brought the poinsettia to us, the plant is actually a euphorbia, generically related to such native plants as the snow-on-the-mountain of the northern Plains, and the leafy spurge that is such a terrible weed in the West. It shows its botanical kinship in a number of ways, but especially by its milky juice, and its inconspicuous groups of flowers surrounded by very showy bract-like leaves.

For what we call poinsettia flowers are not flowers at all. Those inconspicuous little yellow nubbin things at the tips of the branches are the real flowers. The leaf-like character of the bright red members can easily be determined by comparing them with the green leaves farther down the stem.

The plant's botanical name, *Euphorbia pulcherrima*, is a frank acknowledgement of its handsome appearance, for it translates into English as "very beautiful euphorbia."

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• Books Off the Press •

A.S.T.M. STANDARDS ON TEXTILE MATERIALS: With Related Information—A.S.T.M. Committee D-13—*Amer. Soc. for Test. Mat.*, 457 p., illus., \$2.25, paper.

THE AVIATION ANNUAL OF 1944—Reginald M. Cleveland and Frederick P. Graham, eds.—*Doubleday, Doran*, 224 p., \$3.50. Reviewing the achievements of the year 1943 with "forewords" by prominent men in the aeronautics field.

THE BIOCHEMISTRY OF MALIGNANT TUMORS—Kurt Stern and Robert Willheim—*Reference Press*, 951 p., \$12.

DIESEL LOCOMOTIVES: Mechanical Equipment—John Draney—*Amer. Tech. Soc.*, 472 p., illus., \$4. A practical treatise on the operation and maintenance of railway Diesel locomotives.

FOOD CRISIS—Roy F. Hendrickson—*Doubleday, Doran*, 274 p., \$2.50.

THE FORESTRY DIRECTORY—Compiled by Tom Gill and Ellen C. Dowling—*Amer. Tree Assn.*, 411 p., \$2.

GALAXIES—Harlow Shapley—*Blakiston*, 229 p., illus., \$2.50.

GLIDERS AND GLIDER TRAINING—Emanuel Stieri—*Duell, Sloan & Pearce*, 118 p., \$3. A beautifully illustrated book of instruction and reference.

HENRY S. PRITCHETT: A Biography—Abraham Flexner—*Columbia Univ.*, 211 p., illus., \$2.75.

INTER-AMERICAN EDUCATION: A Curriculum Guide—Effie G. Bathurst and Helen K. Mackintosh—*Gov't Print. Off.*, 66 p., illus., 15 c., paper. Bulletin 1943, No. 2.

LABORATORY MANUAL OF EXPLOSIVE CHEMISTRY: A simple, comprehensive treatment of propellants, Raw Materials, Nitrocellulose, Smokeless Powder, and High Explosives—Allen L. Olsen and John W. Greene—*Wiley*, 106 p., illus., \$1.75.

MAN THE MEASURE: A New Approach to History—Erich Kahler—*Pantheon Books*, 700 p., \$5.

A MANUAL OF MEDICAL PARASITOLOGY—Clay G. Huff—*Univ. of Chic.*, 88 p., \$1.50.

THE MIND OF THE INJURED MAN—Joseph L. Fetterman—*Industrial Med. Book Co.*, 260 p., illus., \$4.

PRINCIPLES AND APPLICATIONS OF ELECTROCHEMISTRY—H. Jermain Creighton—*Wiley*, 477 p., illus., \$5. This is a fourth edition and Volume 1 of a two-volume set.

PYROTECHNICS: Civil and Military—G. W. Weingart—*Chem. Pub.*, 220 p., illus., \$5.

TECHNIQUES OF FISHPOND MANAGEMENT—Lawrence V. Compton—*Gov't Print. Off.*, 22 p., illus., 10c, paper.

Question Box

AERONAUTICS

What new invention eliminates the danger of a parachutist's getting caught in the plane's tail assembly? p. 397.

What use is being made of veteran Army airplanes? p. 397.

AGRICULTURE

How many cinchona plants were sent recently to South America? p. 395.

BOTANY

What Christmas plant is a native American? p. 400.

DENTISTRY

What solution has been found to be about 40-per-cent-effective in preventing tooth decay? p. 388.

EMBRYOLOGY

How can the breeding of certain fur-bearing animals be speeded? p. 399.

ENGINEERING

What new instrument can identify particles only 1/100,000th of an inch in diameter? p. 386.

GENERAL SCIENCE

What are some of the researches which the annual report of the Carnegie Institution describes? p. 387.

MEDICINE

Who has been appointed head of the new medical information service? p. 388.

NUTRITION

What easily prepared dish can help fill out wartime diets? p. 399.

ORDNANCE

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PUBLIC HEALTH

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What type of virus may be causing the present influenza epidemic in the U. S.? p. 398.

SAFETY

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What were some of the odd accidents which occurred during 1943? p. 397.

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